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S E C R E T

OSA-2693-69

14 October 1969

MEMORANDUM FOR: Director of Special Activities

THROUGH : Deputy for Operations/OSA

SUBJECT : Report of Tests and Evaluations

REFERENCES :
(1) Memorandum for DD/SA OSA-0041-69 dated 9 Jan 1969

(2) Memorandum for DD/SA OSA-0029-69 dated 21 Jan 1969

(3) Memorandum for D/SA OSA-1081-69 dated 20 June 1969

(4) Memorandum for Record OSA-1083-69 dated 28 July 1969 Attachment #1

1. This memorandum is for your information.

2. The referenced memoranda provide a history of the proposed thermal layer to be installed in the S1010 PPA for cold-water-immersion protection.

3. This report describes the final evaluation, conclusions, and proposed recommendations with respect to the thermal layer protective assembly.

S E C R E T

GROUP 1
Excluded from automatic downgrading and declassification

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4. The equipment described in the final report is unclassified as before and distribution will be made to all related pressure-suit programs.

25X1A

[redacted]

AMS/OSA

Attachment
As stated above

25X1A

AMS/OSA/[redacted]
Distribution:
1 - Addee w/att
1 - D/O/OSA w/att
1 - C/Idea/O/OSA w/att
1 - SAS/O/OSA w/att
1 - AMS/OSA w/att
1 - " w/o att
1 - RB/OSA w/o att

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EVALUATION OF COLD-WATER SURVIVAL PROTECTION PROVIDED BY THE S-1010 PILOT S PROTECTIVE ASSEMBLY UTILIZING A THERMAL PROTECTIVE LAYER

FINAL EVALUATIONS
5 OCTOBER and 6 OCTOBER 1969

[redacted]

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15 October 1969

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1. Background -

Testing of the S1010 PPA in cold-water immersion is of record in previously cited memoranda. For this final evaluation exercise, it was necessary, because of the season, to artifically create a cold environment. The Climatic Chamber at the School of Aerospace Medicine, Brooks AFB, San Antonio, Texas, was selected as an ideal test location.

2. Method -

An engine shipping cover, which served as the water immersion tank was placed in the cold chamber. Pre-chilling to 15° F ambient temperature along with four-hundred (400) pounds of block ice were sufficient to lower the water temperature to 40° F. A thermal layer, orally inflatable, was installed in a S1010 PPA which would adequately fit the test subjects. A change in design from previous models of this garment allowed for the oral inflation tube to penetrate the suit on the left arm. This modification provided for easier inflation than in the original design wherein the tube came out at the right wrist. Inflation of both the raft floor

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and the hood were accomplished with the prototype bilge pump and all tasks were performed but with some effort on the part of the subjects. For the final test the suit was donned and the subjects placed in the water tank cooled to 40°F.

3. Results -

Charts 1 and 2 illustrate the events, temperatures, time periods, and comments of observers and subjects. In comparing earlier exposures without the thermal layer, it becomes apparent that much added protection is provided with the air space created by the thermal garment. Little or no discomfort was experienced by either subject while in the water. Once in the raft and enclosed inside the inflatable hood and floor, the subject experienced no adverse effects and was, in fact, quite comfortable. After two (2) hours, the experiment was terminated since 40°F water temperature was difficult to maintain.

4. Discussion -

Survivable immersion time in cold water has been extended noticeably with the use of the termal protective layer. Pilot acceptance will depend upon fit and comfort; however, since pressure-suit easements have been increased, it is felt that for the added protection the garment will be well tolerated. A thermal layer is presently being fabricated for installation in an operational S1010 PPA for pilot acceptance studies.

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TABLE #1

TIME	EVENTS	TEMPERATURE (°F) ORAL	AIR	WATER	RAFT	GARMENT PRESSURE	REMARKS
1300	Suit donning	98.6	70	--	--	--	Suit was donned in a cool environment vent air used until exposure in water
1325	Entered water and inflated garment	99.6	15	41	--	40 mhg	No severe coldness noted on entry - difficult inflating garment - inflation hose to be elongated
135[illegible]	Water immersion period	99.3	15	40	--	30 mhg	Coldness noted especially in extremities no shivering
1355	Boarded life raft re-inflated garment	99.3	15	40	--	40 mhg	During period of inflation - some exertion experienced in accomplishing inflations - hand pump was used for these tasks and to pump water out of raft
		--	--	--	--	--	
1405	Inflated floor and hood	--	15	40	20	40 mhg	
1420	Raft period	99.3	15	40	--	40 mhg	Quite comfortable in raft closed up and almost dry
1455	Raft period	98.4	15	40	--	40 mhg	
151[illegible]	Re-entered water	98.0	15	40	--	40 mhg	Some coldness noted on re-entry no shivering as yet
1520	Water immersion	97.0	15	40	--	40 mhg	Beginning to shiver
1525	Ended test - left water	97.0	15	40	--	--	Shivering experienced until after duffing suit within 10 minutes completely recovered

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TABLE #2

TIME	EVENTS	TEMPERATURE (°F) ORAL	AIR	WATER	RAFT	GARMENT PRESSURE	REMARKS
0830	Suit donning	98.6	32	37	--	--	Suit donned in a cool environment vent air used until exposure in water
0902	Entered water and inflated garment	98.6	32	37	--	40 mhg	No severe coldness upon water entry also experienced difficulty inflating garment
0917	Water immersion period	99.4	32	37	--	40 mhg	No discomfort
0932	Water immersion period	97.	32	37	--	40 mhg	Slight shivering
0934	Ended test Pulled from water	97.	32	37	--	--	Some shivering until after doffing suit Returned to normal almost immediately

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